

WHAT IS CLAIMED IS:

1. A sequential mesa type avalanche photodiode comprising:
 - an n-type semiconductor substrate; and
 - a sequential mesa portion formed on an upper part of the n-type semiconductor substrate, said sequential mesa portion comprising a plurality of semiconductor layers which include:
 - an n-type light absorbing layer,
 - an n-type electric field relaxation layer formed on an upper part of the n-type light absorbing layer,
 - a p-type electric field concentration layer formed on the n-type electric field relaxation layer, and
 - a p-type multiplying layer formed on an upper part of the p-type electric field concentration layer and laminated by epitaxial growth,
 - wherein the p-type electric field concentration layer and the n-type electric field relaxation layer form a pn junction,
 - wherein a carrier density of the n-type electric field relaxation layer is larger than a carrier density of the p-type electric field concentration layer, and
 - wherein when light is incident from the n-type semiconductor substrate toward the n-type light absorbing layer, electrons and positive holes are generated in the

25 sequential mesa portion and positive holes are a main carrier, and there is a single-peaked characteristic in which light-receiving current based on movement of the electrons and the positive holes is larger at a central portion of the sequential mesa portion than at a peripheral portion of the sequential mesa portion.

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2. The sequential mesa type avalanche photodiode according to claim 1, wherein the plurality of semiconductor layers include an n-type buffer layer formed between the n-type semiconductor substrate and the n-type light absorbing layer.

3. The sequential mesa type avalanche photodiode according to claim 1, wherein the n-type light absorbing layer comprises an n⁻-type InGaAs.

4. The sequential mesa type avalanche photodiode according to claim 1, wherein the plurality of semiconductor layers include a p-type contact layer formed on the p-type multiplying layer.

5. The sequential mesa type avalanche photodiode according to claim 4, wherein the p-type contact layer comprises a p⁺-type InGaAs.

6. The sequential mesa type avalanche photodiode according to claim 1, wherein the n-type semiconductor substrate comprises an n⁺-type InP.

7. The sequential mesa type avalanche photodiode according to claim 6, wherein the n-type electric field relaxation layer comprises an n⁺-type InP, the p-type electric field concentration layer comprises a p⁻-type InP, and the p-type multiplying layer comprises a p⁻-type InP.